

### **REMARKS/ARGUMENTS**

Claims 37 and 39-55 are pending in this application. Claims 37 and 39-55 are rejected in the Office action of April 11, 2005. Claim 37 is hereby amended. Support for the amendment to claim 37 may be found in the specification on page 2, lines 26-28. In view of the amendments and remarks made herein, Applicants respectfully request reconsideration of claims 37-55.

#### **Rejections under 35 U.S.C. § 102(b)**

Claims 37, 40 and 41 are rejected under 35 U.S.C. § 102(b) as anticipated by Denzinger *et al.* (U.S. Pat. No. 5,175,361, hereinafter referred to as "Denzinger"). Denzinger does not disclose a polymer for use in dental restoratives wherein the polymer has a backbone structure consisting essentially of a first monomer unit comprising acrylic acid (AA); a second monomer unit comprising maleic acid (MA); and a third monomer unit comprising a free-radical polymerizable cyclic vinyl amide selected from the group consisting of N-vinyl-2-pyrrolidone, N-vinylcarbazole, N-vinylsuccinimide, N-vinylcaprolactam, and N-vinylimidazole; wherein the polymer optionally has a free-radical or visible light curable (VLC) moiety pendant to the polymer backbone. Since Denzinger does not recite all of the limitations of claim 37 as amended, claim 37, and dependent claims 40 and 41 are not anticipated by Denzinger. Applicants respectfully request withdrawal of this rejection.

#### **Rejections under 35 U.S.C. § 103(a)**

Claims 37, 39-41, 43 and 48-54 are rejected under 35 U.S.C. § 103(a) as obvious over Xie *et al.* (J.M.S.-Pure Appl. Chem., A35 (4), pp. 547-561 (1998), hereinafter referred to as "Xie I") or Culbertson *et al.* (ACS Symposium Series, 755, 2000, pp. 222-232, hereinafter referred to as "Culbertson (Symposium Series)") in view of Culbertson *et al.* (US Pat. No. 5,639,142, hereinafter referred to as "Culbertson"). The combination of Xie I or Culbertson (Symposium Series) in view of Culbertson does not suggest the claimed terpolymer having a backbone structure consisting essentially of acrylic acid (AA); maleic acid (MA); and free-radical polymerizable cyclic vinyl amide selected from the group consisting of N-vinyl-2-pyrrolidone, N-vinylcarbazole, N-vinylsuccinimide, N-vinylcaprolactam, and N-vinylimidazole. The combination of Xie I or Culbertson (Symposium Series) in view of Culbertson does not

suggest a dental restorative comprising a polymer wherein the polymer has a backbone structure comprising acrylic acid (AA); maleic acid (MA); and a free-radical polymerizable cyclic vinyl amide; and an inorganic glass powder. The combination of Xie I or Culbertson (Symposium Series) in view of Culbertson does not suggest a method for preparing a polymer to be used in dental restoratives comprising polymerizing monomers comprising acrylic acid (AA); maleic acid (MA); and a third monomer unit comprising a free-radical polymerizable vinyl amide.

Xie I and Culbertson (Symposium Series) do not suggest the use of maleic acid in an acrylic acid and N-vinyl pyrrolidone terpolymer, as each of these references are directed to acrylic acid-itaconic acid-NVP terpolymers. Maleic acid, which has a higher concentration of acid groups, is not mentioned at all in either of these references. However, Xie I specifically teaches that the major problem associated with the comparative formulations is the presence of COOH groups directly attached to the polymer backbone in close proximity to each other. (Xie I, page 555, first full paragraph). Xie I goes on to explain:

Not all the carboxyl groups on polyacids of this type are converted to carboxylate groups during the course of the reaction. Some free COOH groups remain unreacted because they are inaccessible for steric reasons. Also, as COOH groups on the polyacrylate chain become ionized, the remaining or nearby hydrogen becomes firmly bound by electrostatic forces; as a result, the metal ions are increasingly hindered in their movements to react at carboxyl sites. Further, vitrification significantly reduces diffusion of the  $\text{Ca}^{++}$  or  $\text{Al}^{+++}$  to available  $\text{COO}^-$  moieties.

Xie I at 555, first full paragraph. In other words, Xie I teaches that having more free COOH groups actually makes the polymers less desirable as dental restoratives because of the negative properties resulting from the increased number of COOH groups. By “significantly reducing” the diffusion of  $\text{Ca}^{++}$  or  $\text{Al}^{+++}$  to available  $\text{COO}^-$  moieties, the ability of the polymer to crosslink *via* salt bridges, which gives the restorative its strength, is significantly hindered. There is no motivation to substitute maleic acid, with a higher concentration of acid groups for itaconic acid, which has a lower concentration of acid groups. There is no reasonable expectation of successfully preparing a polymer for a dental restorative by using maleic acid, with a higher concentration of acid groups, rather than itaconic acid when Xie I explicitly teaches that a higher number of acid groups has a negative effect on the polymer’s properties when used as a dental restorative.

Culbertson mentions the use of maleic acid in dental restoratives, not in an acrylic acid, maleic acid, N-vinyl pyrrolidone terpolymers, but rather, in homopolymers and co-polymers which will have pendant amino acid groups. (See, Culbertson, column , second full paragraph). There is no suggestion within Culbertson, Culbertson (Symposium Series), or Xie I, or any combination thereof, to modify the itaconic acid, acrylic acid and N-vinyl pyrrolidone terpolymers of Culbertson (Symposium Series) or Xie I with maleic acid. Culbertson merely lists monomers useful in homopolymers or copolymers. Reading Culbertson in view of Xie I, which describes the problem with acid groups on the polymer backbone, one would not be motivated to substitute maleic acid for itaconic acid in the polymers of Xie I. **The MPEP explicitly states** that “[i]f the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.” (MPEP § 2143.01 V). There simply is no reasonable expectation that maleic acid could be substituted for itaconic acid in Xie I or Culbertson (Symposium Series). Accordingly, Applicants respectfully submit that claims 37, 39-41, 43 and 48-54 are non-obvious over Xie I and/or Culbertson (Symposium Series) in view of Culbertson.

Claims 37 and 39-55 are rejected under 35 U.S.C. § 103(a) as obvious over Xie *et al.* (J.M.S.-Pure. Appl. Chem., A35(10), pp. 1631-1650 (1998), hereinafter referred to as “Xie II”) in view of Culbertson (US Pat. No. 5,639,142, “Culbertson”). The combination of Xie II in view of Culbertson does not suggest the claimed terpolymer having a backbone structure consisting essentially of acrylic acid (AA); maleic acid (MA); and free-radical polymerizable cyclic vinyl amide selected from the group consisting of N-vinyl-2-pyrrolidone, N-vinylcarbazole, N-vinylsuccinimide, N-vinylcaprolactam, and N-vinylimidazole. The combination of Xie II in view of Culbertson does not suggest a dental restorative comprising a polymer wherein the polymer has a backbone structure comprising acrylic acid (AA); maleic acid (MA); and a free-radical polymerizable cyclic vinyl amide; and an inorganic glass powder. The combination of Xie II in view of Culbertson does not suggest a method for preparing a polymer comprising polymerizing monomers comprising acrylic acid (AA); maleic acid (MA); and a third monomer unit comprising a free-radical polymerizable vinyl amide.

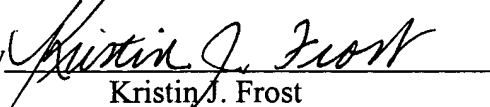
Moreover, Xie II, like Xie, teaches that a major problem with acrylic acid copolymers used in dental restoratives is the presence of COOH groups attached directly to the polymer backbone in close proximity to one another. (Xie II, page 1616, second paragraph). Again, in Xie II, some of these COOH groups remain unreacted because they are inaccessible for steric reasons. (Xie II, page 1616, second paragraph). Xie II states: "[i]t is presumed that the strength and fracture resistance of the material are therefore, weakened due to this steric hindrance, which brings about significantly reduced  $\text{-COO}^{++}\text{Al}$  interaction (cluster or salt bridge formation) in the cement. (Xie II, page 1616, second paragraph). One reading Xie would not be motivated to substitute itaconic acid with an acid having a greater concentration of COOH groups. One reading Xie II would not be motivated to substitute maleic acid for itaconic acid because Xie II explicitly teaches that the strength and fracture resistance of dental restoratives are weakened by the presence of a higher concentration of acid groups. There is no motivation or suggestion to combine Xie II with Culbertson to get Applicants' claimed invention. With no suggestion to combine these references, and no reasonable expectation of success if the references are combined, the only rationale for combining the references is that the combination would be obvious to try, which is not a permissible rationale for combination. Accordingly, Applicants respectfully submit that claims 37 and 38-55 are non-obvious over Xie II in view of Culbertson.

In view of the amendments and remarks made herein, Applicants respectfully submit claims 37 and 39-55 are patentable over the cited references. Reconsideration and allowance of those claims is appropriate and is respectfully requested.

Respectfully submitted,

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By



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